

C. REMARKS / ARGUMENTS

1. Status of the Claims

Claims 1-26 are currently pending in the application.

Claims 1-9, 12-18 and 21-24 have been rejected. Claims 10, 11, 19 and 20 have been objected to.

Claims 8 and 9 (second set) have been canceled, and new claims 25 and 26 added, for reasons described in section 2 below.

Applicant notes with appreciation that claims 10, 11, 19 and 20 have been objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant has not rewritten claims 10, 11, 19, and 20 in independent form, in the belief that independent claims from which claims 10, 11, 19 and 20 depend are allowable, as discussed below.

2. Objections to Claims

Claims 8 and 9 have been objected to because of misnumbering: inadvertently, two sets of claim 8 and 9 had been included in the original set of claims that were submitted.

To correct the error, the second set of claims 8 and 9, i.e. those claims that were mistakenly numbered 8 and 9, have been canceled. New claims 25 and 26 have been added.

No new matter is added by this amendment, which was made solely to correct for the inadvertent claim numbering error, and for reasons that do not have anything to do with the patentability of the claims. New claim 25 corresponds exactly to original "second" claim 8. New claim 26 corresponds exactly to original "second" claim 9.

3. Rejection of Claims 1-7, 9, 12, 18 and 21-23 Under 35 U.S.C. 103(a)

Claims 1-7, 9, 12-18 and 21-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,550,345 to Letton ("Letton") in view of U.S.

Pat. No. 6,577,700 to Fan et al. ("Fan").¹ The Applicant respectfully traverses this rejection.

Applicant submits that, for the reasons set forth below, the Examiner has failed to establish a *prima facie* case of obviousness of claims 1-7, 12-18, and 21-23. See MPEP 2142 ("The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.")

It is well known that, in order to establish a *prima facie* case of obviousness, a rejection must satisfy at least the following:

- A) The prior art reference(s) must teach or suggest all of the elements and limitations recited in the claims;
- B) There must be some suggestion, teaching, or motivation to combine the references on which the rejection is based; and
- C) There must be a reasonable expectation of success.

See MPEP 2142.

Applicant submits that the Examiner's rejection of claims 1-7, 9, 12-18 and 21-23 satisfies none of the criteria above (neither A) nor B) nor C)).

**A) The Documents cited by the Examiner (Letton and Fan),
Either Alone or in Combination, Fail to Teach or Suggest All of the
Elements of Claims 1-7, 9, 12-18 and 21-23**

Applicant respectfully submits that neither Letton nor Fan, either alone or in combination, teaches or suggests the subject matter of independent claims 1, 9, and 13. (Of the rejected claims 1-7, 9, 12-18 and 21-23, claims 1, 9, and 13 are independent. Claims 2-7 depend on claim 1. Claim 12 depends on claim 9. Claims 14-18 and 21-23 depend on claim 18.)

Specifically, Applicant submits that at least the following elements of independent claims 1, 9, and 18 cannot be found in either Letton and Fan, either alone

¹ In view of the Examiner's statements on pages 6-8, Applicant believes that the Examiner meant to reject claims 1-7, 9, **12-18**, and 21-23, rather than claims 1-7, 9, **12, 18** and 21-23, as written on Page 2, 7th line from the bottom in the Office Action.

or in combination:

- 1) performing a tomography measurement of a fluid mixture, the fluid mixture comprising at least a first fluid component characterized by a first phase and a second fluid component characterized by a second phase, so as to determine **a concentration ratio between a first phase component and a second phase component** within the fluid mixture (claims 1 and 9);
 - 2) obtaining first and second approximate flow measurements **for the fluid mixture**, by using first and second transducer sensors to transmit a wave through the fluid mixture and detect the transmitted wave (claim 1);
 - 3) computing the two phase flow rate of the fluid mixture **as a known function of the ratio ρ** , the first and second approximate flow measurements, the speed and direction propagation of each ultrasonic wave relative to the direction of flow of the fluid mixture (claim 1);
 - 4) a tomography system for determining the **concentration ratio between the first component and the second component of a fluid mixture** that contains at least a first component characterized by a first phase and a second component characterized by a second phase (claim 13);
 - 5) a first sensor for providing a first approximate flow measurement **for the fluid mixture** (claim 13);
 - 6) a second sensor for providing a second flow measurement **for the fluid mixture** (claim 13);
 - 7) a processor for computing the two phase flow rate of the fluid mixture using a known relationship between the **concentration ratio**, and the first and second flow measurements for the fluid mixture (claim 13).
- (boldface added).

Letton

Regarding element 1) and 4), Applicant does not find in Letton any disclosure of measuring the concentration ratio between the first phase component and the second phase component of a fluid mixture containing the two phase components, in particular

using a tomography system. The Examiner acknowledges this point by stating in the Office Action, p. 3, lines 5-7, that "Letton fails to teach performing tomograph measurement of the fluid mixture flowing through the vessel so as to determine a ratio ρ between the first component and the second component within the fluid mixture."

Regarding limitations 2), 5), and 6), Applicant does not find in Letton any disclosure of making first and second approximate flow measurements for the **2-phase fluid mixture**, and using these approximate flow measurements in order to compute the actual flow rate of the fluid mixture. The portion of Letton quoted by the Examiner (Col. 9, lines 15-19) to support the view that Letton discloses these limitations does not at all relate to any flow measurements of a fluid mixture having two phase components. In contrast, they describe the measuring of the speed of sound through the gas phase section and the liquid phase section, respectively:

The measured speed of sound from the transducers 1115, 1125 also provides an indication of the composition of the gas phase. The measured speed of sound from transducers 1015, 1025 gives an indication of the composition of the liquid phase.

Col. 9, lines 15-19 of Letton.

Measuring the speed of sound through each of the separate, single phase component of a fluid mixture is entirely different from measuring the fluid flow of a fluid mixture (having 2 phase components).

Further, Applicant submits that nowhere in Letton can there be found any disclosure of making first and second approximate flow measurements of a fluid mixture (to be combined later with a tomographic measurement of the concentration ratio between the phases to yield the exact two-phase fluid mixture.)

Regarding limitation 3), nowhere in Letton can there be found any disclosure of computing an exact flow rate of a two-phase fluid mixture using the measured concentration ratio, and the first and second approximate measurements of the flow of the two-phase fluid mixture. Col. 2, lines 36-38, quoted by the Examiner on page 2, does not disclose this limitation at all. On the contrary, Col 2, lines 36-38 describes a processor that calculates flow velocity for **each phase** of the two-phase flow, not the

flow velocity of the two-phase fluid mixture:

Based on this configuration, an associated processor calculates flow velocity and speed of sound for each phase of the two-phase flow.

Col. 2, lines 36-38 of Letton.

Regarding limitation 7), nowhere in Letton is there found any disclosure of a processor for computing the two phase flow rate of a fluid mixture (having two phase components) using the measured concentration ratio, and the first and second approximate fluid flow measurements.

For these reasons, Letton does not teach or suggest any of the limitations 1) - 7) above.

Fan

Fan relates to an image reconstruction technique for imaging fluid flows using ECT. Contrary to the Examiner's statements, nowhere does Fan teach or disclose the measuring of the concentration ratio between a first phase component and a second phase component in a two-phase fluid mixture. The Examiner correctly pointed out that "Fan et al teaches . . . a new image reconstruction technique for imaging two-and three-phase flows using electrical capacitance tomography; and a method for obtaining a cross-section image of a two-phase fluid flowing through a conduit." However, this is not what is claimed in any of the claims of the present application, and therefore is not relevant to any of the limitations 1) - 7) above. Limitations 1) and 4), relating to the measurement of a concentration ratio between the two phases of a two-phase fluid mixture, is not taught, suggested, or mentioned anywhere in Fan. Limitations 2), 3), 5), 6), and 7) of course have nothing to do with Fan.

For these reasons, Fan does not teach or suggest any of the limitations 1) – 7) above.

In sum, Applicant submits that because a) Letton fails to teach or suggest all of the elements 1) – 7) above, and b) Fan also fails to teach or suggest all of the elements 1) – 7) above, the proposed combination of Letton and Fan fails to teach or suggest all of the elements 1) – 7) above.

B) There is no Suggestion, Teaching, or Motivation to Combine the documents (and) on which the Examiner's Rejection is based

It is well known that the cited documents themselves must suggest the desirability of making the proposed combination, in order for a *prima facie* case of obviousness to be established. MPEP §§ 2141 – 2142. In other words, the teaching or suggestion to make the claimed combination (as well as the reasonable expectation of success) must both **be found in the prior art** itself, and not based on applicant's disclosure. MPEP 2142. Also, "[T]he evidence of record must identify an objective source of the motivation to combine A with B in the manner proposed." In Re San Su Lee, 277 F.3d 1338 (CAFC 2002).

Applicant respectfully submits that the record does not establish the requisite motivation for combining Letton with Fan. Nowhere in Letton is there the slightest suggestion of the desirability of performing the tomographic measurement of the concentration ratio between different phase components of a fluid mixture, in order to determine the fluid flow of the fluid mixture. (Also, Fan does not even teach or suggest the tomographic measurement of such a concentration ratio.)

Because nowhere in Letton or Fan is there any suggestion of the desirability of making the proposed combination, Applicant submits that the Examiner has failed to meet his burden of providing a suggestion of the desirability of making the proposed combination. (See MPEP 2142 and In Re San Su Lee, 277 F.3d at 1338: "*The initial burden is on the Examiner to provide some suggestion of the desirability of doing what the inventor has done.*")

See also MPEP2143.01: The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

C) The Proposed Combination Lacks the Requisite "Reasonable Expectation of Success" Standard for Prima Facie Obviousness

The proposed combination of Letton with Fan not only fails to teach the limitations of the claims of the present invention, but also is devoid of any reasonable

expectation of success. The image reconstruction of two-phase flows, taught in Fan, is not relevant to any aspect of the subject matter of Letton, and there is a total lack of any reasonable expectation that combining the image reconstruction device of Fan would make the Letton device work successfully.

Regarding the Examiner's statement that "It would have been obvious to one of ordinary skill in the art at the time that the invention was made to have used the image reconstruction technique of Fan et al in the apparatus of Letton for the purpose of capturing the real time data of the turbulent fluctuation in the flow field," Applicant notes the capturing real time data of turbulent fluctuation in the flow field is not recited in any of Applicant's claims, nor is such real time data capturing described in the Applicant's specification, and is totally irrelevant to Applicant's invention and patent application.

In sum, for all of the reasons above, Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness, and that there is no proper basis for the 35 U.S.C. 103(a) rejection of independent claims 1, 9, and 13 over Letton in view of Fan. Applicant respectfully requests that the 35 U.S.C. 103(a) rejection of claims 1, 9, and 13 be withdrawn.

It is well known that "[i]f an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." MPEP 2143.03; In re Fine, 837 F.2d 1071, 2 USPQ2s 1596 (Fed. Cir. 1988).

Claims 2-7 all depend on claim 1, and therefore include all the limitations of claim 1. Claim 12 depends on claim 9, and therefore includes all the limitations of claim 9. Claims 14-18 and 21-23 all depend on claim 13, and therefore include all the limitations of claim 13. Since claims 1, 9, and 13 are all nonobvious under 35 U.S.C. 103, for all the reasons discussed above, it follows that claims 2-7, 12, 14-18, and 21-23 depending therefrom are also nonobvious under 35 U.S.C. 103, at least as depending from an allowable base claim.

For these reasons, it is submitted that there is no proper basis for the Section 103 rejection of claims 1-7, 9, 12-18 and 21-23, and that claims 1-7, 9, 12-18 and 21-23 are allowable.

4. Rejection of Claim 8 Under 35 U.S.C. § 103(a)

Claim 8 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Letton in view of Fan as applied to claim 1 above, and further in view of US Patent No. 6,668,619 to Yang ("Yang"). Applicant respectfully traverses.

Claim 8 depends on claim 1, and therefore includes all the limitations of claim 1. For reasons discussed above, claim 1 is allowable, and not obvious over Letton in view of Fan. It follows that claim 8 depending therefrom is also nonobvious under 35 U.S.C. 103, at least as depending from an allowable base claim.

5. Rejection of Claim 24 Under 35 U.S.C. § 103(a)

Claim 24 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Letton in view of Fan as applied to claim 13 above, and further in view of US Patent No. 6,546,811 to Fincke ("Fincke"). Applicant respectfully traverses.

Claim 24 depends on claim 13, and therefore includes all the limitations of claim 13. For reasons discussed above, claim 13 is allowable, and not obvious over Letton in view of Fan. It follows that claim 13 depending therefrom is also nonobvious under 35 U.S.C. 103, at least as depending from an allowable base claim.

6. Conclusion

On the basis of the foregoing amendments, Applicant respectfully submits that all of the pending claims 1-24 are in condition for allowance. An early and favorable action is therefore earnestly solicited. If there are any questions regarding these amendments and remarks, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,



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